

## PATENT SPECIFICATION

632,861



Application Date: April 30, 1947.

No. 11595/47.

Complete Specification Left: April 30, 1948.

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Index at acceptance:—Class 80(ii), D2b, D3(a: k), D7c6.

## PROVISIONAL SPECIFICATION

## Improvements in and relating to Gear Change Mechanism

I, EWEN GORDON M'EWEN, of 29, Montpelier Row, Twickenham, Middlesex, and similarly the ratio through the downshift clutch is lower than low gear.

SPECIFICATION No. 632,861

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of The Minister of Supply, of Adelphi, Strand, London, W.C. 2.

THE PATENT OFFICE,  
30th March, 1950.

DS 29999/1(29)/3359 150 3/50 R

OF THIS INVENTION TO  
scurity by separating the baulking and syn-  
chronizing functions of the synchro  
clutches as at present in use.

According to the invention, therefore,  
20 auxiliary upshift and downshift syn-  
chronizing shafts are provided each carry-  
ing a synchronizing clutch, one side of  
each clutch being coupled to an input  
shaft and the other side to an output  
25 shaft.

Preferably the gear ratio overall from  
input to output with the upshift clutch  
engaged is so chosen that it is higher (i.e.  
less reduction of speed) than top gear and  
30 similarly the ratio with the downshift  
clutch engaged is lower (i.e. more reduc-  
tion of speed) than low gear.

In carrying the invention into effect  
according to one convenient mode, the  
35 customary gear changing dog clutches are  
provided with baulk rings, in order to  
prevent engagement until synchronizing  
occurs, but the usual synchronizing cones  
are omitted. Two auxiliary synchroniz-  
40 ing shafts are provided each carrying a  
clutch, which are so arranged that one  
side is coupled by a gear train to an input  
shaft and the other to an output shaft.

The gear ratio through the upshift  
45 clutch, as before mentioned, is preferably  
so chosen that it is higher than top gear

action of the driver in selecting a higher  
gear engages the upshift synchronizer  
clutch which may be hydraulically  
operated, when synchronism occurs the  
65 baulk ring allows the dog clutch to  
engage, and the first movement of the  
selector rail carrying the clutch towards  
the engaged position trips out the syn-  
chronizing clutch. A similar sequence of  
70 operations occurs for downshift but in this  
case the downshift clutch is engaged.

One advantage arising from the use of  
separate clutches is that they can be  
located where convenient and there are  
75 no longer limitations on size set by the  
centre distance and shaft dimensions of  
the gear trains. It is also possible ade-  
quately to cool the clutches by air or  
oil.

With this invention considerable varia-  
tion may be made to the orthodox gear  
box. In addition the synchronizing  
drives can, if desired, be used as auxiliary  
high and low gears, in which case it  
85 would be necessary that they should be  
of more substantial proportions than if  
they only have to deal with synchronizing  
torque.

Dated this 30th day of April, 1947.

R. A. BUDDEN,  
Acting for Applicant.

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## PROVISIONAL SPECIFICATION

### Improvements in and relating to Gear Change Mechanism

I, EWEN GORDON M'EWEN, of 29, Montpelier Row, Twickenham, Middlesex, a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention relates to gear change mechanisms such as may be used on motor road vehicles and in particular the change speed mechanism of the kind known as synchro-mesh systems. It is to be observed that the design of satisfactory synchronisers of orthodox types becomes more difficult as the size of the vehicle or load increases and it is therefore an object of this invention to overcome such difficulty by separating the baulking and synchronizing functions of the synchro clutches as at present in use.

According to the invention, therefore, auxiliary upshift and downshift synchronizing shafts are provided each carrying a synchronizing clutch, one side of each clutch being coupled to an input shaft and the other side to an output shaft.

Preferably the gear ratio overall from input to output with the upshift clutch engaged is so chosen that it is higher (i.e. less reduction of speed) than top gear and similarly the ratio with the downshift clutch engaged is lower (i.e. more reduction of speed) than low gear.

In carrying the invention into effect according to one convenient mode, the customary gear changing dog clutches are provided with baulk rings, in order to prevent engagement until synchronizing occurs, but the usual synchronizing cones are omitted. Two auxiliary synchronizing shafts are provided each carrying a clutch, which are so arranged that one side is coupled by a gear train to an input shaft and the other to an output shaft.

The gear ratio through the upshift clutch, as before mentioned, is preferably so chosen that it is higher than top gear

and similarly the ratio through the downshift clutch is lower than low gear.

According to a modification the clutches could be replaced by epicyclic units in which the reaction member is normally free, but is held stationary for the engagement of the synchronizing drive.

In the operation of a gear box embodying this invention, when an upshift is to be performed, as for example from 2nd to 3rd gear, the dog clutch required is urged into engagement by a spring or other suitable means producing only a relatively small axial force, engagement being prevented by the baulk rings. The action of the driver in selecting a higher gear engages the upshift synchronizer clutch which may be hydraulically operated, when synchronism occurs the baulk ring allows the dog clutch to engage, and the first movement of the selector rail carrying the clutch towards the engaged position trips out the synchronizing clutch. A similar sequence of operations occurs for downshift but in this case the downshift clutch is engaged.

One advantage arising from the use of separate clutches is that they can be located where convenient and there are no longer limitations on size set by the centre distance and shaft dimensions of the gear trains. It is also possible adequately to cool the clutches by air or oil.

With this invention considerable variation may be made to the orthodox gear box. In addition the synchronizing drives can, if desired, be used as auxiliary high and low gears, in which case it would be necessary that they should be of more substantial proportions than if they only have to deal with synchronizing torque.

Dated this 30th day of April, 1947.

R. A. BUDDEN,  
Acting for Applicant.

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## COMPLETE SPECIFICATION

## Improvements in and relating to Gear Change Mechanism

I, EWEN GORDON M'EWEN, of 29, Montpelier Row, Twickenham, Middlesex, a British Subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to gear change mechanisms such as may be used on motor road vehicles and in particular to the change speed mechanisms of the kind known as synchro-mesh systems.

More particularly, the invention is concerned with a gear change mechanism having clutch means and including a separate synchronizing clutch for ensuring that the two rotating parts to be engaged to obtain a speed ratio through the clutch means are brought to substantially the same speed, and in accordance with the invention the synchronizing clutch is carried by an auxiliary shaft and has two rotatable co-operating elements whereof one element is permanently geared to one rotating part and to the input shaft and the other element is permanently geared to the other rotating part and to the output shaft.

Preferably the gear ratio overall from input to output with a synchronizing clutch engaged and serving as an upshift clutch is so chosen that it is higher (i.e. less reduction of speed) than top gear and similarly the ratio with a further synchronizing clutch engaged and serving as a downshift clutch is lower (i.e. more reduction of speed) than low gear.

In carrying the invention into effect according to one convenient mode, the customary gear changing dog clutches are provided with baulk rings, in order to prevent engagement until synchronizing occurs, but the usual synchronizing cones are omitted. Two auxiliary synchronizing shafts are provided each carrying a clutch, which are so arranged that one side is permanently coupled by a gear train to an input shaft and the other to an output shaft.

The gear ratio through the upshift clutch, as before mentioned, is preferably so chosen that it is higher than top gear and similarly the ratio through the downshift clutch is lower than low gear.

Reference will now be made to the accompanying drawings in which:—

Figure 1 is a diagrammatic view of a gearbox embodying the present invention.

Figure 2 is a diagrammatic view of a modification of the invention.

A gear box of the constant mesh type

having four speeds is shown, the reverse idler gear being omitted for clarity. An input shaft 1 is shown having a gear 2 in constant mesh with a pinion 3, and a pinion 4 in constant mesh with a pinion 5 provided on a layshaft 6. The layshaft is provided with an additional gear 7 in constant mesh with a gear 8.

Loosely mounted on a main-shaft 9 are gears 10, 11, 12 which are adapted to be clutched thereto by means of dog-clutch members 13 and 14 operated respectively by selector rail mechanism as is well understood. Also the usual baulk rings 17, 18, 19 and 20 are provided but synchronizing cones are omitted.

Two auxiliary shafts 21 and 22 are provided on which are mounted cone clutches 23 and 24 forming synchronizing clutches one member of each clutch being integral with the gears 3 and 8 respectively. On the opposite end of each of the shafts 21, 22 are gears 25, 26 which are permanently geared to a pinion 27 on the output shaft 28.

The shaft 21 and clutch 23 are employed for changing from a lower to a higher gear ratio whereas the shaft 22 and clutch 24 are employed for changing down from high to low gear. For example when changing from 2nd to 3rd gear the appropriate dog clutch is urged into engagement by a spring or other suitable means producing only a relatively small axial force, engagement being prevented by the baulk rings. The action of the driver in selecting a higher gear engages the upshift synchronizer clutch which may be hydraulically operated, and when synchronism occurs the bulk ring allows the dog clutch to engage, and the first movement of the selector rail carrying the dog clutch towards the engaged position trips out the synchronizing clutch. A similar sequence of operations occurs for downshift but in this case the downshift clutch is engaged.

According to a modification of the invention the cone clutches are each replaced by an epicyclic gear such as is shown in Figure 2. A sun pinion 29 is integral with the gear 8 whilst planet pinions 30 are carried by a spider 31 extending from the end of the auxiliary shaft 22. The reaction member or annulus 32 is normally free but is held stationary by a brake band 33 for the engagement of the synchronizing drive.

One advantage arising from the use of the separate clutches or their equivalent as hereinbefore described is that they can

be located where convenient, and there are no longer limitations on size set by the centre distance and shaft dimensions of the gear trains. It is also possible to cool adequately the clutches by air or oil.

With this invention considerable variation may be made to the orthodox gear box. In addition the synchronizing drives can, if desired, be used as auxiliary high and low gears, in which case it would be necessary that they should be of more substantial proportions than if they only have to deal with synchronizing torque.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

- 20 1. A gear change mechanism having clutch means and including a separate synchronizing clutch for ensuring that the two rotating parts to be engaged to obtain a speed ratio through the clutch
- 25 means are brought to substantially the same speed, wherein the synchronizing clutch is carried by an auxiliary shaft and has rotatable cooperating elements whereof one element is permanently geared to the one rotating part and to the input
- 30 shaft and the other element is per-

manently geared to the other rotating part and to the output shaft.

2. A gear change mechanism wherein the parts, such as dog clutch members, to be engaged to obtain different speed ratios are brought to substantially the same speed by synchronizing clutches carried by auxiliary shafts, each of the clutches being constructed and arranged as claimed in claim 1.

3. A gear change mechanism as claimed in Claims 1 or 2 wherein an epicyclic gear or gears is or are employed as the synchronizing clutch or clutches a sun wheel of the or each gear being geared to the input shaft and a planet pinion carrier being geared to the output shaft and means being provided for restraining the movement of the reaction member or annulus, of the or each epicyclic gear.

4. A gear box having a gear change mechanism as claimed in Claims 1, 2 or 3 and substantially as described with reference to the accompanying drawings.

5. An improved gear change mechanism substantially as described with reference to the accompanying drawings.

Dated this 30th day of April, 1948.

R. A. BUDDEN,  
Acting for Applicant.

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copies, price 2s. 0d. each (Inland) 2s. 1d. (abroad) may be obtained.

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[This Drawing is a reproduction of the Original on a reduced scale.]

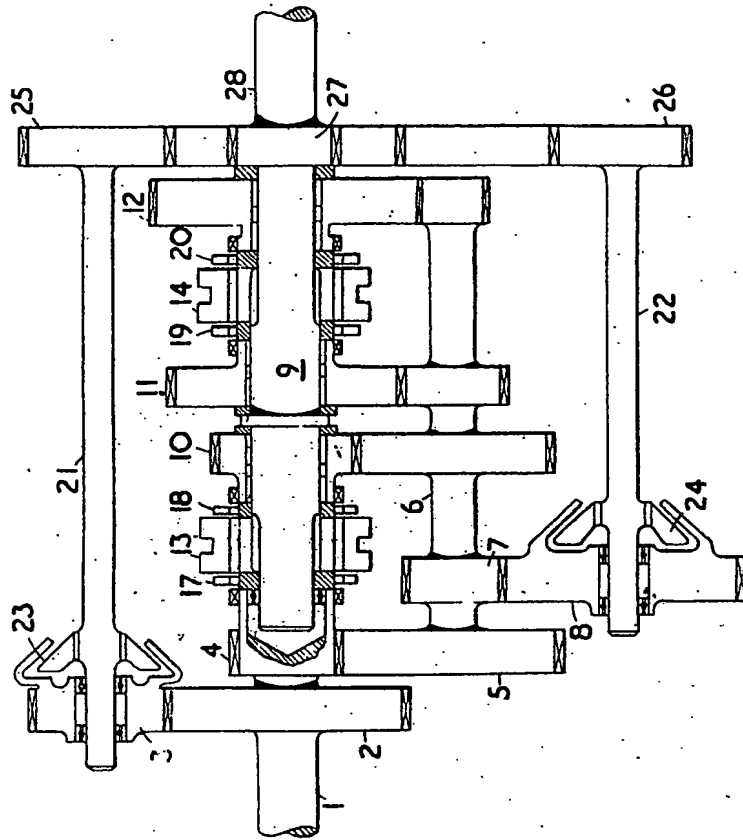
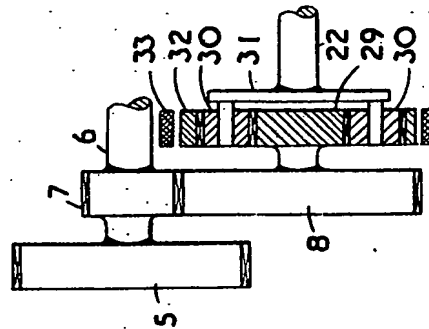


FIG. 1

FIG. 2



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